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A booklet designed for elementary school students to be used independently from and in addition to the regular classroom curriculum in mathematics is presented. The operations of addition, subtraction, multiplication, and division are given practical importance by their application in the use of money and foreign money exchange. The Guatemalan, Mexican, and English systems of money are explained and compared with that of the United States. The teacher should identify potential users, orient them to the area to be explored, and stimulate and maintain their interest in sustained independent effort.

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TO THE TEACHER

This Independent Learning booklet is designed to help you open new avenues of learning for students who show a special interest in mathematics and a readiness to study on their own. Such students will be able to work directly from printed materials, using abstract ideas to follow a line of mathematical reasoning. Occasionally, of course, even the ablest of them will need your help to get over some of the rough spots, but your main concern in connection with the booklet will be to identify students who can benefit from using it, to orient them to the area to be explored, and to stimulate and maintain their interest in sustained independent effort.

Since the topic of the booklet trends outward from the regular curriculum, the challenge to do this independent work should arise from students' own searching in the field or from new interests that you have succeeded in awakening. Students will profit most if they elect voluntarily to do the work rather than receiving it as an assignment or as a means of earning extra credit.

The material is so organized that students may progress at their own best pace. They should be encouraged to move ahead in discovering for themselves meanings and approaches in mathematics beyond those usually taught in the classroom, but there should be no requirement to complete parts or all of the booklet, or to follow a set schedule.

While serious effort will be necessary, students should find the work enjoyable because of their interest in the subject. They should gain a real sense of satisfaction through working individually or with other students in independently achieving understanding, overcoming temporary difficulties, and evaluating their own progress. Your encouragement and occasional direct help will of course be needed.

This booklet obviously is not aimed at developing complete understanding of an area of mathematics. Its purpose is rather to provide an introduction, or an approach novel to the student, which will create new interests and the desire to go on from here to further study in other sources.

A brief teacher's guide has been prepared to assist you in using this booklet with your students. Copies of the guide are distributed to your district office by the Department of Education, San Diego County. Additional copies are always available.

INDEPENDENT LEARNING BOOKLET

We Travel with Money

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INTRODUCTION

This is the story of two children your own age—Bill and Barbara Johnson, who are twins—and their older sister Marcia. While traveling with their parents they learn to use the money of other countries. They also learn more about our own United States money.

Have you ever visited another country and used its money instead of our own? It's interesting. Take a trip with the Johnson family and see how this is done.

As you read the story, you will find questions to answer. Try them to see how well you understand what you are learning. Then check your thinking with the answers in the booklet. If you miss a point, go back and study the part that explains it. Your teacher will help you when you really get "stuck," but first try to find the answers by yourself.

You will need paper and pencil to do the work asked for in this booklet. Please do not write in the booklet itself since other children will be using it.

Our United States Money

It's easy to work with United States money because it is based on **ten** like the decimal place-value system you use in your regular arithmetic work. In this system we need only ten digits **0,1,2,3,4,5,6,7,8,9** to write any number. That's because we can change the value of a digit by changing its place in a numeral. Look at the chart below.

hundreds	tens	ones	decimal point	tenths	hundredths
5	5	5.		5	5

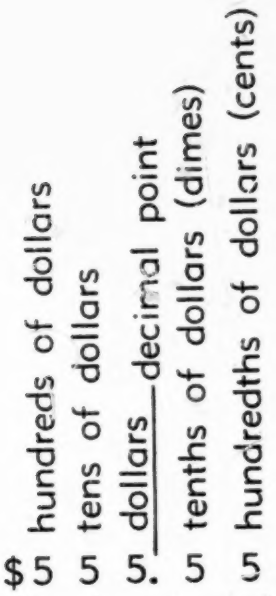
Five hundred fifty-five and fifty-five hundredths

In a decimal place-value system, the ones' place is the center. The decimal point shows where this is. As we move to the left, each place is ten times as large in value as the place at its right. As we move to the right, each place is ten times as small in value as the place at its left.

In the numeral **555.55** the center is 5 ones. The 5 at the left of the ones stands for 5 tens, 50, or 5×10. The 5 at the right of the ones stands for 5 tenths, .5, or $5 \div 10$. Can you see that digits written to the right of the decimal point are less than one whole? They are called decimal fractions. Can you figure out why?

The chart below helps you see how decimal fractions are related to common fractions.

decimal fractions	common fractions	read as
.5	$\frac{5}{10}$	five-tenths
.50	$\frac{50}{100}$	fifty hundredths
.05	$\frac{5}{100}$	five hundredths
.55	$\frac{55}{100}$	fifty-five hundredths



Five hundred fifty-five dollars and fifty-five cents

In numerals which stand for United States money the ones' place is the place of the dollars, the tenths' place is the place of the dimes, and the hundredths' place is the place of the cents. **The dollars' place is the center.** The decimal point shows where this is. As we move to the left of dollars' place we have tens of dollars, hundreds of dollars, and so on. As we move to the right of dollars' place we have tenths of dollars (dimes) and hundredths of dollars (cents). The chart at the left shows these relationships in our money system.

In the numeral **$555.55** the center is 5 dollars. Can you see that all amounts written at the right of the decimal point are less than one whole dollar? They are parts of a dollar. Now do you see how the two systems are alike?

You can refer to the table on page 7 to review how to write dollars and parts of dollars (dimes and cents).

How Much More Do We Need?

The twins, Bill and Barbara Johnson, and their older sister Marcia are very excited. They are going on a trip with their parents to other countries where Mr. Johnson will buy things for his gift shop. They will visit Guatemala, Mexico, and England. Can you find these countries on a map?

Barbara and Bill are getting ready for their trip.

1. What do you think the twins are doing now?

Bill says, "I have 5 dollars and 17 cents. How much do you have, Barbara?"

Barbara answers, "I have 2 dollars, 3 half dollars, 2 quarters, 5 dimes, 3 nickels, and 12 pennies. Is that as much as you have, Bill?"

"I don't know until we find out how much you have all together," Bill replies.

2. a. How much money does Barbara have all together? How can you find out?
   b. Does Bill have more money than Barbara? How do you know? How much more does he have?

"I want to save enough to have ten dollars to take on our trip," says Bill. "Let's see how much more I'll have to save."

3. Can you figure out how much more Bill will have to save? He now has \$5.17 and he wants to save \$10.00 all together. \$5.17 + what = \$10.00?
4. If Barbara also wants to save \$10.00, how much more will she have to save if she now has \$4.77? \$4.77 + ? = \$10.00?

"We'll really have to figure out some way of getting more money, Barbara, if we want to have ten dollars each to spend on our trip. What can we do?"

"Let's ask Marcia," says Barbara, "maybe she can help us." Check your thinking on the opposite page.

CHECKING YOUR THINKING

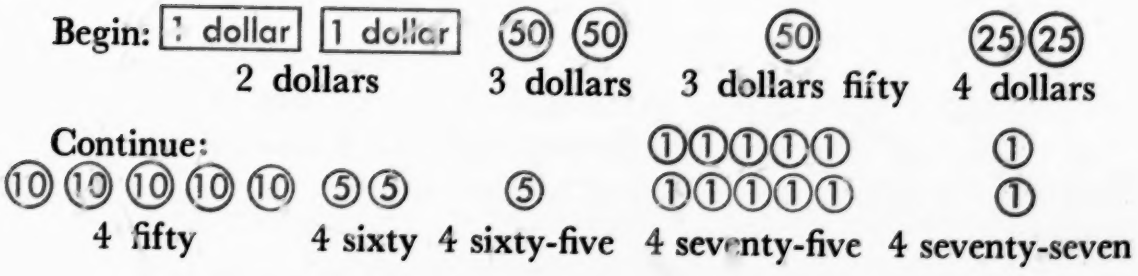
1. Barbara and Bill are saving money for their trip. They are trying to find out how much they now have.

2. a. Barbara has 4 dollars and 77 cents ($4.77). You can add to find the total amount of Barbara's money. (You must remember to write the dollars in the dollars' place, the dimes in the dimes' place, and the cents (pennies) in the cents' place.)

$$\begin{array}{r} {\scriptstyle 1\ \ 1\ \ 1\ \ 1\ \ 1} \\ \$2.00 \\ \$1.50 \\ \$\ .50 \\ \$\ .50 \\ \$\ .15 \\ \$\ .12 \\ \hline \$4.77 \end{array}$$

$2.00 (2 dollars = 2 × $1.00)
$1.50 (3 half dollars = three 50's or 3 × $.50)
$ .50 (2 quarters = two 25's or 2 × $.25)
$ .50 (5 dimes = five 10's or 5 × $.10)
$ .15 (3 nickels = three 5's or 3 × $.05)
$ .12 (12 cents = twelve ones or 12 × $.01)

You can also count to find out the total amount of Barbara's money. You can use the pictures of the money below to help you count.



You should get the same total whether you add or count. You see, there is usually more than one way to solve a problem!

b. Yes, Bill has more money than Barbara because he has 5 dollars and 17 cents, which is more than 4 dollars and 77 cents (5 is more than 4).
Bill has 40 cents ($.40) more than Barbara. You can subtract to find out.

Did you think the way we show on the following page?

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Step 1

$5.17
−4.77
0

1. 7 cents from 7 cents = no cents (shown by **zero**).

Step 2

4 11
$5.17
−4.77
40

2. I can't take 7 dimes from 1 dime so I change 1 of the dollars into 10 dimes. 10 dimes + 1 dime = 11 dimes; 7 dimes from 11 dimes = 4 dimes.

Step 3

4 11
$5.17
−4.77
$ .40

3. 4 dollars from 4 dollars = 0 dollars. The remainder is 40 cents. I write the decimal point to locate the dollars' place (even though there are no dollars in the answer), and I then write the $ sign in the answer.

Bill will have to save $4.83 more. You can find the answer mentally (in your head) or with pencil and paper. You can think: If Bill had only $5.00 he would need to save $5.00 more since 5 + 5 = 10; but he has 5 dollars and 17 cents so he needs 5 dollars minus 17 cents, which is $4.83 (500 − 17 = 483); therefore he only needs 4 dollars and 83 cents. Or you can subtract with pencil and paper. Did you think as we show below?

Step 1

9 10
$10.00
−5.17

1. I can't take 7 cents from no cents, and there are no dimes in the dimes' place, so I change the 10 dollars into 9 dollars and 10 dimes.

Step 2

9 9 10
$10.00
−5.17
$ 4.83

2. I change 1 of the 10 dimes to 10 cents and subtract: 10 cents − 7 cents = 3 cents; I have 9 dimes remaining; 9 dimes − 1 dime = 8 dimes; 9 dollars − 5 dollars = 4 dollars. I write the decimal point to locate the dollars' place. I then write the $ sign in my answer.

You should get the same answer either way.

4. Barbara will need to save $5.23. You can find the answer either by "building up" or by "taking away." You can think: Barbara has 4 dollars and 77 cents. She needs 23

cents more to have another dollar to equal 5 dollars (77 + 23 = 100). She also needs 5 more dollars to equal 10 dollars. So she needs 5 dollars and 23 cents all together.

Or you can subtract \$4.77 from \$10.00: \$10.00 − \$4.77 = \$5.23. If you have difficulty, review the steps in Example 3.

Do you like to be sure of your knowledge? **A table** is a set of information arranged in an orderly way so that relationships can be seen easily. The table below gives the names of our coins, and how their values are written. If you don't know the values and how to write them, you may want to learn them.

TABLE OF VALUES OF UNITED STATES COINS

COIN	VALUE	HOW WRITTEN
1 dollar	= 100 cents	\$1. or \$1.00
1 half dollar	= 50 cents	50¢ or \$.50
1 quarter	= 25 cents	25¢ or \$.25
1 dime	= 10 cents	10¢ or \$.10
1 nickel	= 5 cents	5¢ or \$.05
1 cent (penny)	= 1 cent	1¢ or \$.01

A dollar bill (a paper dollar) is also worth 100 cents. It can be written as \$1.00 or \$1.

The table below lists the different coins and some of the notes ("paper money") which are used in our country.

TABLE OF UNITED STATES MONEY

COINS	NOTES
1 cent (penny)	1 dollar
5 cents (nickel)	2 dollars
10 cents (dime)	5 dollars
25 cents (quarter)	10 dollars
50 cents (half dollar)	20 dollars
1 dollar	50 dollars
	100 dollars

You may want to refer to your arithmetic book to review reading and writing dollars and cents.

FINDING OUT ON YOUR OWN

Are you interested in finding out more about money and our money system? You can read in an encyclopedia about the history of our money, our different kinds of coins and bills, why we have the system we do, and so on. Look up such topics as **Money, Monetary Systems**, or **U.S. Money**. Or you can read some interesting books:

Author	Title
Buehr, Walter	**Treasure** Money since early times.
Foster, Constance J	**This Rich World** Rich in ideas about money.
Leeming, Joseph	**From Barter to Banking** How man has developed and used money, up to modern banking.
Sootin, Laura	**Let's Go to a Bank** We visit a bank to learn about banks and what they do.
Wilcox, Louise	**What Is Money?** Modern money; its history, circulation, use, and investment.

Are you interested in famous Americans? Read about Thomas Jefferson and Gouverneur Morris to find out how they helped develop the United States money system.

Are you interested in coin collecting? You can buy a coin folder for United States one-cent pieces and fill it as far as possible with circulated coins (coins in daily use).

You can also write for a set of this year's coins which have never been circulated. The set will cost the regular value of each coin (that is, a nickel would cost 5 cents), plus a little more for postage and service. The address is:

Treasury Department
Office of the Treasurer of the United States
Washington 25, D. C.

Have your teacher or your parents check your letter.

Let's Keep An Account!

The twins asked Marcia to help them plan to save money for the trip.

"In the first place," said Marcia, "you can't run to the store every time you get your allowance. You should only buy the things you really need. Then we must think of some ways for you to earn money. You might like to keep an account (or record) of your money as I do of mine. I'll show you how."

Marcia made a form for the twins to use in keeping an account of their money. They decided to keep their account together until they had saved the total amount they wanted. How much will this total be? \$10.00 + \$10.00 = ? Do 2 tens = 20? Does 2 × ten dollars equal twenty dollars?

The form Marcia made looks like this:

ACCOUNT FORM

Name _____ Number _____

DATE	DESCRIPTION	IN	OUT	BALANCE

Let's see if you can understand how the twins kept an account of their money.

Study the form carefully. What would the twins write on the line after **Name**? Yes, "Barbara and Bill Johnson." What would they write after **Number**? Yes, "1," since this is their first account form.

1. Do you know why the twins need to number the forms they use? Check your thinking on page 11.

Now look at the first column at the left headed **Date**. What would they write in this column? Of course, the date when they put money into their account or when they take money out. This helps them keep a more accurate record.

Under **Description** they write where their money came from or how it was spent. For example, the amount they start with might be described as **Beginning Cash.**

What do you think the columns headed **In** and **Out** mean? Yes, when they put money into their account, the amount is written in the **In** column. When they take money out, the amount is written in the **Out** column.

On this form, **Balance** means the total amount of money they have at the time. For example, your bank balance is the amount you have in the bank at any one time.

Marcia suggested that Bill and Barbara write the total amount of the money they had as **Beginning Cash** in the **In** column and also in the **Balance** column. Do you see why?

2. Bill had $5.17 and Barbara had $4.77. What amount should the twins write as **Beginning Cash**? How can you find out? Check your thinking on page 11.

The twins wrote the date as 6/21. What do you think these numerals stand for? Does studying the date below in relation to the one above give you an idea?

June 21

In 6/21 the 6 at the left stands for June, which is the sixth month of the year. The 21 stands for the day of the month. You need to know the **order** of the months if you are to read and write dates in this way.

3. Try to write the names of the twelve months in correct order. Be sure your list is correct. Now, number the months starting with 1 for January, 2 for February, 3 for March and so on. Check your thinking on page 11.

The twins' account form now looks like this:

ACCOUNT FORM

Name	Bill and Barbara Johnson			Number 1					
DATE	DESCRIPTION	IN		OUT		BALANCE			
6/21	Beginning Cash	9	94			9	94		

Do you think it's important to write all the digits which stand for money in their correct places (columns)? Why? Notice that we do not have to use the $ sign on this form. Do you see why it isn't needed? Why don't we have to use the decimal point on our account form? Do the lines serve the same purpose? Yes, they locate the dollars' place; they separate the dollars from the cents.

CHECKING YOUR THINKING

1. Bill and Barbara need to number each form they use to keep the account forms in **order.** They need to know which form is first, which is second, and so on, so they can tell which one is the last. The last form will show their **Present Balance,** or what they have at that time. We can use numbers to put things in order. We know that 2 always follows 1, 3 follows 2, 4 comes after 3, and so on.
2. The twins should write $9.94 as **Beginning Cash** since this is the sum (total) of the amount they have together. You can add to find the answer. Bill thought in this way:

Step 1

$$\begin{array}{r} {\scriptstyle 1} \\ \$5.17 \\ +4.77 \\ \hline 4 \end{array}$$

1. 7 cents + 7 cents = 14 cents (1 dime and 4 cents); I write the 4 (cents) in the cents' column of the answer. I carry the 1 dime (10 cents) to the dimes' column.

Step 2

$$\begin{array}{r} {\scriptstyle 1} \\ \$5.17 \\ +4.77 \\ \hline 94 \end{array}$$

2. 1 dime + 1 dime + 7 dimes = 9 dimes; I write the 9 (dimes) in the dimes' column of the answer.

Step 3

$$\begin{array}{r} {\scriptstyle 1} \\ \$5.17 \\ +4.77 \\ \hline \$9.94 \end{array}$$

3. 5 dollars + 4 dollars = 9 dollars; I write the 9 (dollars) in the dollars' column of the answer; I put in the decimal point to locate the dollars' place. I then write the $ sign in the answer.

3. Numbers for months in order:

1 January	**4** April	**7** July	**10** October
2 February	**5** May	**8** August	**11** November
3 March	**6** June	**9** September	**12** December

How Much Do We Have?

Bill and Barbara looked for opportunities to earn money. They kept an accurate record of their money for the week. They entered (wrote) the amounts they earned and their allowances on their account form, and figured the new balance each time. They also entered the amounts they spent and figured the new balance each time.

Can you keep their accounts for them? (Perhaps your teacher will supply you with some account forms to use, or you can draw them yourself.) Check your thinking on page 13.

June 22

1. The twins received their weekly allowance of $1.00 each. How much did they get all together? Where do they write this amount? How much is their new balance?

June 22

2. Bill pulled weeds in the neighbor's garden. He worked for two hours at 25¢ an hour. How much did he earn? Where will he write this amount? What is the new balance? Where will he write the new balance?

June 23

3. Barbara sat with the neighbor's baby for an hour and a half. She earned 40¢ an hour. How much did she receive? What will she write in the **Balance** column?

June 25

4. The twins went to a party. They spent $1.00 for a gift. Where will they write this? What is the new balance?

June 26

5. Bill and Barbara went to the fair. They each had a 5-cent glass of lemonade and a 10-cent ice-cream cone. What do they write in the **Out** column? What is the new balance?

June 28

6. The twins received their allowance of $1.00 each again. What is the new balance?

Have you completed the twins' account for the week?

7. What is their last balance? How much do they now have? How much more do they need to have $20.00?

Marcia told the twins they should balance their account each week. Do you know what she means? Here, to **balance** means to keep two amounts **equal** (the same). Marcia said that to balance an account the total (sum) of the **Ins** should equal the total (sum) of the **Outs** plus the **New Balance.**

Ins = Outs + New Balance This is like $5 = 2 + 3$. Or, the total (sum) of the **Outs** plus the **New Balance** should equal the total (sum) of the **Ins.**

Outs + New Balance = Ins This is like $2 + 3 = 5$. Or, because subtraction is the opposite of addition (that is, it can "undo" addition) you can also balance your account by subtraction.

Ins − Outs = New Balance This is like $5 - 2 = 3$.

8. a. On the twins' weekly account form what was the total of the **Ins**?
   b. What was the total of the **Outs** for the week?
   c. What was the **New Balance** at the end of the week?
   d. Balance the account using all three ways just described. In each case, the **New Balance** should be the same.

CHECKING YOUR THINKING

1. \$1.00 + \$1.00 = \$2.00. Since this is money put in, it is written in the **In** column. The twins' new balance is \$11.94; \$9.94 + \$2.00 = \$11.94.
2. Bill earned \$.50 (50¢). $2 \times \$.25 = \$.50$. This is written in the **In** column. The new balance is \$12.44; \$.50 + \$11.94 = \$12.44. This is written in the **Balance** column.
3. Barbara earned \$.60: 1 hour = \$.40; $\frac{1}{2}$ hour = \$.20; \$.40 + \$.20 = \$.60. She writes \$13.04 in the **Balance** column because \$.60 + \$12.44 = \$13.04.
4. The twins write the \$1.00 in the **Out** column because it is money taken out. The new balance is \$12.04; \$13.04 − \$1.00 = \$12.04.
5. The twins write \$.30 in the **Out** column: $2 \times \$.05 = \$.10$; $2 \times \$.10 = \$.20$; \$.10 + \$.20 = \$.30. Their new balance is \$11.74; \$12.04 − \$.30 = \$11.74.
6. The new balance is \$13.74; \$11.74 + \$2.00 = \$13.74.

7. The last balance is \$13.74. They now have \$13.74. They need \$6.26 more. \$13.74 + \$6.26 = \$20.00; or \$20.00 − \$13.74 = \$6.26. Does your account form look like this?

ACCOUNT FORM

Name	Bill and Barbara Johnson					Number	1
DATE	DESCRIPTION	IN		OUT		BALANCE	
6/21	Beginning Cash	9	94			9	94
6/22	Allowances	2	00			11	94
6/22	Pulling weeds	0	50			12	44
6/23	Baby-sitting	0	60			13	04
6/25	Gift			1	00	12	04
6/26	Lemonade and cones			0	30	11	74
6/28	Allowances	2	00			13	74
		15	04	1	30	13	74

Do you notice that when there are no dollars the twins write a zero in the dollars' place? Do you know why this is? Yes, to be sure they have not left out the dollars by mistake.

8. a. The total of the **Ins** for the week was \$15.04

2
\$9.94
2.00
0.50
0.60
2.00
\$15.04

b. The total of the **Outs** for the week was \$1.30

\$1.00
+0.30
\$1.30

c. The new balance is \$13.74; \$15.04 − \$1.30 = \$13.74

d. To balance the account by addition:

Ins = Outs + New Balance or **Outs + New Balance = Ins**

\$15.04 = \$1.30 + \$13.74 **\$1.30 + \$13.74 = \$15.04**

To balance the account by subtraction:

Ins − Outs = New Balance

\$15.04 − \$1.30 = \$13.74

Do you feel you can balance an account?

Guatemalan Money— Another Decimal System

When the Johnson family landed in Guatemala City, Marcia exclaimed, "It's cool and the air smells fresh! How high are we, Mother?"

"The altitude here is about 5000 feet. We're almost a mile high," answered Mother. "That's why it's cool even though it's in the Torrid Zone."

"Gee, I thought the higher up you got the hotter it would be," said Bill, "because it's nearer to the sun."

"No," said Marcia, "I learned that for every 1000 feet you go up the temperature drops about 4 degrees." (We write 4 degrees as 4°.)

1. If the temperature is 100° at sea level, what would it probably be at 5000 feet?
2. Mountain breezes usually cool Guatemala City so you can subtract another 5° from the temperature. What is the usual temperature then?

Check your thinking on page 16.

"I'm anxious to go shopping," said Barbara, once they were settled in their hotel. "Bill and I want to spend some of the money we saved to buy some things to take home."

"You'll have to change your money for Guatemalan money, Barbara," said Mr. Johnson. "Tomorrow I'll take you to the bank before you go shopping."

The next morning the family went to the bank to change their U.S. money for Guatemalan money. Bill and Barbara gave the man at the bank 10 American dollars. He gave them 10 quetzales. (ket-sol'-es: In quetzales the **e**'s sound about the same as the **e** in **set**; the **a** sounds about the same as the **a** in **father**.) They each took 5 quetzales. He gave Marcia 15 quetzales for her 15 dollars and gave Mr. Johnson 100 quetzales for 100 American dollars.

3. How many quetzales did the Johnsons get for each U.S. dollar? Check your thinking on page 16.

The man explained that the **quetzál** is the basic unit of money in Guatemala, just as the **dollar** is our basic unit.

"It is called a quetzál after our national bird, the quetzál," he said.

"Is this the only kind of money you have?" asked Barbara.

"No," answered the man, "we have a **centavo** or **cent,** as you do." (sen-tá-vo: The **cent** of centavo sounds about the same as our word **cent**; the **a** sounds about the same as the **a** in **father**; the **o** sounds the same as the **o** in **go**.)

"Well," said Bill, "I guess a quetzál is worth the same as a dollar."

Bill wondered how many centavos there were in a quetzál. He watched his dad buy a newspaper. Mr. Johnson gave the newsboy a quetzál. The paper cost 10 centavos. The boy gave Mr. Johnson back in change two 25 centavo coins, three 10 centavo coins, and two 5 centavo coins.

4. How many centavos did Mr. Johnson get in change?

5. Can you tell how many centavos there are in a quetzál? Check your thinking below.

CHECKING YOUR THINKING

1. The temperature at 5000 feet would probably be 80 degrees. There are 5 thousands in 5000; if the temperature drops 4 degrees for each 1000 feet, it would drop 20°; $5 \times 4 = 20$; $100° - 20° = 80°$ (10 tens — 2 tens = 8 tens, or 80).
2. The usual temperature in Guatemala City would be 75 degrees; $80° - 5° = 75°$.
3. They got 1 quetzál for 1 American dollar. A quetzál is worth about a dollar of our money.
4. Mr. Johnson got 90 centavos in change; 50 (two 25's) + 30 (three 10's) + 10 (two 5's) = 90.
5. There are 100 centavos in a quetzál. Did you figure this way: Mr. Johnson gave the newsboy 1 quetzál; the newspaper cost 10 centavos. Mr. Johnson received 90 centavos: 10 centavos (cost of newspaper) + 90 centavos (change) = 100 centavos = 1 quetzál.

Shopping at the Market

The Johnson family went to a large open-air market where the Indians brought their things to sell. Indians in colorful costumes were sitting on the ground with the things they had to sell spread all about them.

Barbara wanted to buy a family of Guatemalan dolls.

1. Barbara and the Indian woman who was selling dolls agreed on 1 quetzál and 50 centavos for 5 dolls. About how much did each doll cost? Give your answer in Guatemalan money. (Q stands for quetzales.)
2. Barbara had 5 quetzales to start with. How much Guatemalan money did she have left after she bought the dolls?
3. Bill saw some stuffed animals. He wanted a giraffe and a horse for his room at home. He bought the animals for 65 centavos each. How many centavos did he spend for the two animals? How many quetzales? How can you find out?
4. How much of his 5 quetzales did Bill have left after he bought his stuffed animals?
5. Marcia bought two meters (a meter is about 39 inches) of cloth at Q 1.85 a meter. How much did she spend?
6. How much did Marcia have left of her 15 quetzales after she bought her cloth?

Check your thinking on pages 18 and 19.

Later the children were discussing their day.

"You know," said Bill, "it's easy to use Guatemalan money. It's so much like ours."

"Yes," said Mr. Johnson, "it is based on 10; it is a decimal money system just as ours is. (Remember, $10 \times 10 = 100$; 100 cents equals $1.00 and 100 centavos equals Q 1.00.) That's why you can add and subtract with it so easily."

"I'm going to make a table to show how Guatemalan money and our money compare," said Barbara.

7. Below is the table Barbara started. Copy and finish it. Notice that she used a line — to show "not any." Check your work on page 19.

TABLE OF GUATEMALAN AND U. S. MONEY

GUATEMALAN	UNITED STATES		
	Dollars	Dimes	Cents
1 quetzál =	1	10	100
1 centavo =	—	—	
5 centavos =	—	—	
10 centavos =			
50 centavos =			
100 centavos =			

CHECKING YOUR THINKING

1. If Barbara bought 5 dolls at 1 quetzál and 50 centavos, each doll cost about 30 centavos. (1 quetzál = 100 centavos; 100 centavos + 50 centavos = 150 centavos or Q1.50.) We can write quetzales and centavos just as we do dollars and cents except we use a Q instead of a dollar sign ($). Did you think: How many 5's in 150? or 150 ÷ 5 = ? There are 30 fives in 150; 150 ÷ 5 = 30.
2. Barbara had 3 quetzales and 50 centavos left. We can add and subtract quetzales and centavos just as we add and subtract dollars and cents.

$$\begin{array}{r} {\scriptstyle 4\ 10} \\ \text{Q}5.00 \\ -\ 1.50 \\ \hline \text{Q}3.50 \end{array}$$

   If you have difficulty doing the subtraction, review the steps on page 6. You can also count up and figure mentally to find how much Barbara has left.
3. Bill spent 130 centavos or 1 quetzál and 30 centavos. You can add or you can multiply:

$$\begin{array}{r} {\scriptstyle 1\ \ \ \

Since there are 100 centavos in a quetzál, 130 centavos = 1 quetzál and 30 centavos, or Q1.30.

4. Bill had 3 quetzales and 70 centavos left. You can figure mentally or subtract using pencil and paper.

$$\begin{array}{r} Q5.00 \\ -\ 1.30 \\ \hline Q3.70 \end{array}$$

5. Marcia spent 3 quetzales and 70 centavos for the cloth. You can add or multiply to find the answer.

$$\begin{array}{r} {\scriptstyle 1\ 1} \\ Q\ 1.85 \\ +\ 1.85 \\ \hline Q\ 3.70 \end{array} \qquad \begin{array}{r} {\scriptstyle 1\ 1} \\ Q\ 1.85 \\ \times\ 2 \\ \hline Q\ 3.70 \end{array}$$

6. Marcia had 11 quetzales and 30 centavos left:

$$\begin{array}{r} Q15.00 \\ -\ 3.70 \\ \hline Q11.30 \end{array}$$

It's easy to add and subtract with Guatemalan money, isn't it?

7. Does your chart look like the one below? Look carefully at each numeral to be sure you are right.

TABLE OF GUATEMALAN AND U. S. MONEY

GUATEMALAN	UNITED STATES		
	Dollars	Dimes	Cents
1 quetzál =	1	10	100
1 centavo =	—	—	1
5 centavos =	—	—(½)	5
10 centavos =	—	1	10
50 centavos =	—(½)	5	50
100 centavos =	1	10	100

(Don't worry if you didn't include the fractions.)

Does this table help you see how much alike the two money systems are?

FINDING OUT ON YOUR OWN

Do you enjoy making tables of comparisons? You might want to complete the following table comparing our money with Guatemalan money. Check your work below.

TABLE OF U. S. AND GUATEMALAN MONEY

UNITED STATES	GUATEMALAN				
	Quetzal	Centavo Coins			
		25	10	5	1
1 dollar =					
1 half dollar =					
1 quarter =					
1 dime =					
1 nickel =					
1 cent =					

Do you enjoy working problems in quetzales and centavos? Make up some problems of your own. The following table shows the kinds of Guatemalan coins and notes.

TABLE OF GUATEMALAN MONEY

COINS	NOTES
$\frac{1}{2}$ centavo	50 centavos
1 centavo	1 quetzál
2 centavos	2 quetzales
5 centavos	5 quetzales
10 centavos	10 quetzales
25 centavos	100 quetzales
	1000 quetzales

TABLE OF U. S. AND GUATEMALAN MONEY

UNITED STATES	GUATEMALAN				
	Quetzal	Centavo Coins			
		25	10	5	1
1 dollar =	1	4	10	20	100
1 half dollar =	$-(\frac{1}{2})$	2	5	10	50
1 quarter =	$-(\frac{1}{4})$	1	$-(2\frac{1}{2})$	5	25
1 dime =	$-(\frac{1}{10})$	$-(\frac{2}{5})$	1	2	10
1 nickel =	$-(\frac{1}{20})$	$-(\frac{1}{5})$	$-(\frac{1}{2})$	1	5
1 cent =	$-(\frac{1}{100})$	$-(\frac{1}{25})$	$-(\frac{1}{10})$	$-(\frac{1}{5})$	1

(Don't worry if you didn't include the fractions.)

Money in Mexico—What's It Like?

The Johnson family had enjoyed Guatemala, but now it was time to leave. They were going to another interesting and beautiful country—Mexico! While they were packing their suitcases, Bill and Barbara were talking about the new country they would visit.

Barbara said, "I know that Mexico and Guatemala are neighbors, but don't they each have their own money?"

"Yes," said Bill, "and we still have some quetzales and centavos left. Mom said we would **exchange** our money for Mexican money while we were waiting in the airport." (To exchange means to give something for something else of equal value.)

Sure enough, this is what they did. Mrs. Johnson and Marcia went first to exchange their Guatemalan money for Mexican money. They also exchanged some U.S. money for Mexican money. Let's see what they did.

1. Marcia got 25 **pesos** in exchange for 2 quetzales. How many pesos did she get for 1 quetzál? Since 2 quetzales = 25 pesos, how many pesos equal 1 quetzál?

   (**Peso** is pronounced as if it were spelled **pay'-so.**)

2. Mrs. Johnson received 100 pesos for 8 U.S. dollars. Can you figure out how many pesos she got for each dollar?

Check your thinking on page 23.

Soon the Johnsons were on the jet plane flying swiftly toward Mexico City. It didn't seem any time at all until they landed there.

"Brrr—," said Mother, "it's chilly!"

"No wonder," said Marcia, "that sign says the elevation is 8000 feet."

3. If the temperature at sea level is 100°, what temperature will it probably be in Mexico City?

Check your thinking on page 23.

On the way to the hotel, Barbara figured out how many U. S. cents it would take to get 1 peso. She thought: Marcia got 25 pesos for Q2.00; Q2.00 = 200 cents. To find out how much each peso is worth in cents I have to find how many 25's there are in 200. I know there are four 25's in 100; there must be eight 25's in 200. $200 \div 25 = 8$; or I can say, $25 \times 8 = 200$. So you should get 1 peso for 8 U.S. cents.

When Barbara told Bill what she had figured out, Bill said, "Let's make a table to show how Mexican money compares with United States money so we will be able to judge prices of things when we shop."

4. The twins began their table with the **peso,** because in Mexico it is the basic unit of money, just as the quetzál is in Guatemala and the dollar is in the United States. Copy and complete the twins' table. Check your work on page 24.

TABLE OF MEXICAN AND U. S. MONEY

MEXICAN	UNITED STATES
1 peso =	8 cents = 8¢ = $.08
10 pesos =	10 × 8 = 80 cents = ____¢ = $____
100 pesos =	100 × 8 = 800 cents = $____
1000 pesos =	1000 × 8 = ____cents = $____

When the Johnsons arrived at the hotel, they saw a sign in a shop window. It looked like this:

Ice cream cones	$1.00
Popcorn	.80
Cokes	.40

"Imagine, one whole dollar for an ice cream cone!" exclaimed Marcia.

"Wait a minute, Marcia," said her father. "That says a peso for a cone, not a dollar. The sign for peso is often the same as our sign for dollar."

"What other kinds of money do they have in Mexico?" asked Barbara.

Mr. Johnson told her that the Mexicans use **centavos.** He asked the children if they could figure out how many centavos there were in a peso.

"Oh, I think I know," answered Barbara. "Since centavo probably comes from **one hundred** just as cent does, there must be 100 centavos in 1 peso. Am I right?"

"Yes, you're right, Barbara. The price for a cone is 1 peso or 100 centavos, both of which equal 8 cents in United States money. The Mexicans use the same sign for centavo that we do for cent (¢)."

5. Can you figure out the cost in Mexican money of popcorn and of a coke?
6. Mr. Johnson bought Bill a coke and Barbara some popcorn. He gave the girl in the shop 2 pesos. How many centavos did he get in change?

Check your thinking on page 24.

CHECKING YOUR THINKING

1. Did you think: If Marcia received 25 pesos for two quetzales, each quetzál is worth one half of 25, or 25 ÷ 2. We can't divide 25 evenly by 2, but we know that there are 2 twelves in 24, so there are 2 twelves in 25 with 1 left over.

   We also know there are 2 halves in 1 whole, $1 \div 2 = \frac{1}{2}$; $12\frac{1}{2} + 12\frac{1}{2} = 25$. Each quetzál equals $12\frac{1}{2}$ pesos. Marcia received $12\frac{1}{2}$ pesos for each quetzál.

$$2\overline{)25}\quad 12 \text{ R } 1$$

$$2\overline{)25}\quad 12\tfrac{1}{2} \quad (1 \div 2 = \tfrac{1}{2})$$

2. Did you think: 100 pesos = $8.00; then 50 pesos = $4.00; 25 pesos = $2.00; $12\frac{1}{2}$ pesos = $1.00. Mrs. Johnson received $12\frac{1}{2}$ pesos for each dollar. It's only right that both the quetzál and dollar equal the same number of pesos since a quetzál is worth about the same amount as a dollar.
3. The temperature in Mexico City will probably be about 68°. The temperature drops 4° for every 1000 feet of elevation (altitude). There are 8 thousands in 8000, so it would drop about 8 × 4. 8 × 4° = 32°.
   If it is 100° at sea level, we subtract the 32° from 100°:

Step 1

$$\begin{array}{r} 9\ 10 \\ \cancel{1\,0\,0}^{\circ} \\ -\ 3\ 2 \\ \hline 8 \end{array}$$

1. We can't take 2 from zero ones so we change the 10 tens (100) to 9 tens and 10 ones and subtract; 10 ones − 2 ones = 8 ones.

Step 2

$$\begin{array}{r} 9\ 10 \\ \cancel{1\,0\,0}^{\circ} \\ -\ 3\ 2 \\ \hline 6\ 8^{\circ} \end{array}$$

2. We then subtract the tens; 9 tens − 3 tens = 6 tens. We then write the degree sign in our answer.

4. **TABLE OF MEXICAN AND U. S. MONEY**

MEXICAN	UNITED STATES
1 peso =	8 cents = 8¢ = \$.08
10 pesos =	10 × 8 = 80 cents 80¢ = \$.80
100 pesos =	100 × 8 = 800 cents = \$8.00
1000 pesos =	1000 × 8 = 8000 cents = \$80.00

5. The price of popcorn is \$.80 in Mexican money, or 80 centavos. The price of a coke is \$.40 or 40 centavos. Do you notice that the Mexicans read and write pesos as we read and write dollars? They also read and write centavos as we read and write cents. They can do this even though the value of their peso is not the same as our dollar and the value of their centavo is not the same as our cent. They can do this because they have a decimal money system as we do.

6. Mr. Johnson received 80 centavos (\$.80) in change. Did you think:

Step 1

$$\begin{array}{r} \$\ .8\ 0 \\ +\ .4\ 0 \\ \hline \$1.2\ 0 \end{array}$$

1. 80 centavos + 40 centavos = 120 centavos (since 8 + 4 = 12, 80 + 40 must equal 120); 120 centavos = 1 peso and 20 centavos.

Step 2

$$\begin{array}{r} \$2.0\ 0 \\ -1.2\ 0 \\ \hline \$\ .8\ 0 \end{array}$$

2. 20 tens − 12 tens = 8 tens; 8 tens = 80 or 80 centavos. Or 120 + 80 = 200 (since 12 + 8 = 20, 120 + 80 must equal 200).

How Much Does It Cost?

The next day the Johnsons took a bus to Taxco to buy silver things for Mr. Johnson's gift shop.

Marcia saw a silver bracelet she wanted to buy. The price tag read $48.50.

1. Marcia gave the shopkeeper 50 pesos to buy the bracelet.
   a. How much did she receive in change?
   b. About how much did the bracelet cost in United States money?

Check your thinking on page 26.

Mr. Johnson bought 25 rings at 10 pesos each. Bill said, "I can figure how much they cost in my head because it's easy to multiply by 10. They will cost 250 pesos because $10 \times 25 = 250$."

Do you know what Bill meant when he said that it was easy to multiply by 10? Study the examples below to see if you can discover how to multiply by 10 mentally ("in your head").

$$\begin{array}{r} 25 \\ \times 10 \\ \hline 250 \end{array}$$

25 multiplicand

product

a	b	c	d	e	f
6	60	600	32	17	175
$\times 10$	$\times 10$	$\times 10$	$\times 10$	$\times 10$	$\times 10$
60	600	6000	320	170	1750

Look at the multiplicand and the product in Example **a**. The 6 is still a 6 in both, but its **value** is changed. It is in ones' place in the multiplicand and in tens' place in the product. The product 60 stands for 10 times as much as the **6** in the multiplicand. We multiplied 6 by 10 in the regular way. We could do this more quickly by putting a zero at the right of the multiplicand: $6 \times 10 = 60$.

In Example **b** the multiplicand is 60. What can we do to multiply quickly by 10? That's right, attach a zero: 600. Is this true with the rest of the examples?

Can you think of an easy way to multiply by 100? How about attaching **two** zeros?

2. Mr. Johnson also bought 12 pairs of earrings at 10 pesos for each pair. How many pesos did the earrings cost all together? Check your thinking below.
3. Barbara bought a ring for 6.50 pesos and a bracelet for 8.95 pesos. She gave the woman in the shop 16 pesos.
   a. How much did Barbara spend for the ring and bracelet?
   b. How much change did she receive?
4. Mrs. Johnson bought a silver pitcher for 125 pesos. She said, "This pitcher would cost 25 dollars in the United States." Did Mrs. Johnson save any money by buying the pitcher? How much?

Check your thinking for questions 3 and 4 on page 27.

The Johnsons finished their shopping and returned to Mexico City. They visited many other interesting places in Mexico, but finally they had to leave.

"I'm sorry we're leaving," said Marcia, "but I'm looking forward to seeing England." The twins agreed.

CHECKING YOUR THINKING

1. a. Marcia received $1.50 (1 peso and 50 centavos) in change; you can subtract:

$$\begin{array}{r} 4\,9\,10 \\ \$5\,0.0\,0 \\ -4\,8.5\,0 \\ \hline \$\ \ 1.5\,0 \end{array}$$

   Or count up: $48.50 + $.50 = $49.00; $49.00 + $1.00 = $50.00; $48.50 + $1.50 = $50.00.

   b. The bracelet cost about $4.00 in American money. 100 pesos = $8.00, 50 pesos = $4.00; 48.50 pesos is almost 50 pesos.

2. The earrings cost 120 pesos ($120.00). $10 \times 12 = 120$. If you feel you need to practice multiplying by 10, complete the following examples before checking the answers at the top of the next page.

a	b	c	d	e
15	242	300	183	50
×10	×10	×10	×10	×10

a. 150 **b.** 2420 **c.** 3000 **d.** 1830 **e.** 500

3. a. Barbara spent $15.45 (15 pesos, 45 centavos).

$$\begin{array}{r} {\scriptstyle 1} \\ \$8.95 \\ +6.50 \\ \hline \$15.45 \end{array}$$

b. Barbara received 55 centavos (55¢ or $.55) in change.

You can subtract to find the answer:

$$\begin{array}{r} {\scriptstyle 5\,9\,10} \\ \$1\,\cancel{6.0}\,\cancel{0} \\ -\,1\,5.4\,5 \\ \hline \$\quad .5\,5 \end{array}$$

Or you can count up: "Fifteen forty five, and 5 is fifteen fifty, and 50 is 16 pesos." $5 + 50 = 55$; $.55.

4. Mrs. Johnson saved 15 dollars in United States money. Did you think: 100 pesos = $8.00; 25 pesos = $2.00; $8.00 + $2.00 = $10.00; $25.00 − $10.00 = $15.00 (savings).

If you had difficulty, refer to Bill's table on page 24. Remember 25 is $\frac{1}{4}$ of 100 or $100 \div 25 = 4$, so 25 pesos = $\frac{1}{4}$ of $8.00, or $8.00 ÷ 4; $8 \div 4 = 2$; 25 pesos = $2.00.

Here is a table of the different kinds of money used in Mexico. It may be helpful to you if you want to know more about Mexican money.

TABLE OF MEXICAN MONEY

COINS	NOTES
1 centavo	1 peso
5 centavos	5 pesos
10 centavos	10 pesos
20 centavos	20 pesos
25 centavos	50 pesos
50 centavos	100 pesos
	1,000 pesos
	10,000 pesos

How Is English Money Different?

When the Johnson family arrived in London they went to the bank to exchange some United States money for one hundred **pounds** of English money.

Bill was surprised. "How can we carry around one hundred pounds of money?" he asked.

The cashier explained that **pound** is the name of the basic unit of money in England. In the beginning an English pound was actually a pound of silver, but later the English developed coins and paper money. Today the English have a paper pound just as we have a paper dollar.

Barbara asked the cashier how much a pound was worth in United States money. He told her the pound was worth about $2.80.

How much is 100 pounds worth in United States money? You can think: If 1 pound = $2.80, then 100 pounds = 100 × $2.80. Can you think of an easy way to multiply by 100? (Do you remember an easy way to multiply by 10?) 100 × $2.80 = $280 (or $280.00). 100 pounds in English money is about the same as $280.00 of our money. (What happens to the decimal point when you multiply by 100?)

We have been learning about decimal systems of money—that is, systems based on ten. For example, we know that in the United States money system 10 × 1 cent = 10 cents or 1 dime, 10 × 1 dime = 10 dimes or $1.00, and so on. The English money system is quite different. It is not based on ten. The English pound can be divided into smaller parts just as we can divide the dollar, the quetzál, or the peso into smaller parts, but the divisions are not based on 10. In fact, the English use several bases. Let's see what some of these are by dividing a pound into shillings and pence.

Bill decided to change one of his English pounds into shillings. The cashier gave him 20 shillings in exchange for the pound. Can you figure out how much each shilling is worth in United States money? How many 20's are there in 280?

Bill subtracted to find out. He said, "I subtracted 20 from 280 fourteen times, so each shilling is worth 14 cents."

"There's an easier way to do it, Bill," said Marcia. "You can divide 280 by 20. If $28 \div 2 = 14$, then $280 \div 20 = 14$."

Do you see why? In the second example you are dividing 280, which is a number 10 times as large in value as the 28 in the first example, but the second divisor (20) is also 10 times as large in value as the 2 in the first example, so the answer is still 14. Whether you subtract or divide, you find that a shilling is worth \$.14 (14 cents) in United States money.

"Is a shilling the smallest English coin?" asked Barbara. "No," answered the cashier, "a shilling can be divided into pence. There are 12 pence in a shilling."

"Your money system is more like our measurement system than our money system," said Marcia, "because we use different bases for measuring units. There are **12** inches in a foot and **3** feet in a yard. In your money you have **12** pence in a shilling and **20** shillings in a pound."

"You're right, Marcia," said Mr. Johnson. "In fact, we borrowed our measures from the English. Our system is called the English system of measures. The English money system, like their measurement system, developed over a long period of time. Some early money units remained, new ones were added, and nobody worked out an easier system."

Does the table below help you see why the English system is not a decimal system?

UNITED STATES AND ENGLISH MONEY SYSTEMS

1 dollar = 10 dimes	1 dime = 10 cents
1 pound = 20 shillings	1 shilling = 12 pence

As you use the English money system you will probably find that it is harder to work with than the decimal systems.

"Can pence also be called cents?" asked Barbara.

"Of course not," answered Bill, "because there are more than 100 pence in a pound."

Was Bill right? Why? How many pence are there in a pound? We know that there are 12 pence in a shilling and 20 shillings in a pound, so there are 20×12 pence in a pound. Does it help to think: Since $2 \times 12 = 24$, then 20×12 must be 240? Bill was right; there are 240 pence in a pound.

"Well," said Barbara, "I have heard of an English **penny**."

"Yes," said the cashier, "we say one penny, but we say twopence, threepence, and so on."

Bill and Barbara decided to find out how much they knew so far about English money. Can you answer their questions?

1. Which is worth more:
   a. 2 pounds or 4 dollars?
   b. 1 shilling or 10 cents?
   c. 1 dollar or 5 shillings?
   d. 1 quarter or 2 shillings?
   e. 1 shilling or 12 pence?

2. Which answer will complete the statement correctly?
   5 pounds has the same value as_____.
   a. $14.00
   b. 100 shillings
   c. 1200 pence
   d. All of these
   e. None of these

CHECKING YOUR THINKING

1. a. 2 pounds is worth more than 4 dollars.
   You can get the answer by thinking: Since 1 pound is more than 2 dollars, 2 pounds must be more than 4 dollars because $2 + 2 = 4$.

   You can also add:

$$\begin{array}{r} {\scriptstyle 1\ \ 1} \\ \$2.80 \\ +2.80 \\ \hline \$5.60 \end{array}$$

   Or you can multiply:

$$\begin{array}{r} {\scriptstyle 1} \\ \$2.80 \\ \times\ \ 2 \\ \hline \$5.60 \end{array}$$

   $5.60 is more than $4.00.

b. 1 shilling is worth more than 10 cents because it is worth 14 cents in United States money; 14 is more than 10.

c. 1 dollar is worth more than 5 shillings. Since 1 shilling is worth 14 cents and five 14's = 70, 5 shillings are worth 70 cents.

$$\begin{array}{r} {\scriptstyle 2} \\ \$.14 \\ \times 5 \\ \hline \$.70 \end{array}$$

d. 2 shillings are worth more than 1 quarter because 2 shillings = 28 cents ($2 \times 14 = 28$) and 1 quarter = 25 cents. 28 cents is more than 25 cents.

e. There are 12 pence in 1 shilling; 1 shilling = 12 pence.

2. All of these

a. 5 pounds equals $14.00

You can add:

$$\begin{array}{r} {\scriptstyle 4} \\ \$2.80 \\ 2.80 \\ 2.80 \\ 2.80 \\ 2.80 \\ \hline \$14.00 \end{array}$$

Or you can multiply:

$$\begin{array}{r} {\scriptstyle 4} \\ \$2.80 \\ \times\ 5 \\ \hline \$14.00 \end{array}$$

Or you can figure: Since 1 pound equals $2.80, 10 pounds equals $10 \times \$2.80$, or $28.00. 5 is half of 10, so one half of $28.00 = $14.00; 5 pounds = $14.00.

b. 100 shillings = 5 pounds

Since there are 20 shillings in 1 pound, there are 5×20 shillings in 5 pounds; five 20's = 100.

$$\begin{array}{r} {\scriptstyle 1} \\ 20 \\ \times 5 \\ \hline 100 \end{array}$$

c. 1200 pence = 5 pounds

Did you think: Since there are 240 pence in 1 pound, there are 5×240 pence in 5 pounds;

You can multiply:

$$\begin{array}{r} {\scriptstyle 2} \\ 240 \\ \times 5 \\ \hline 1200 \end{array}$$

Or you can add:

$$\begin{array}{r} {\scriptstyle 2} \\ 240 \\ 240 \\ 240 \\ 240 \\ 240 \\ \hline 1200 \end{array}$$

How Do We Write English Money?

Bill ran into a problem with English money.

"When I walked by a store window," he said, "I saw a price tag on a game. I couldn't figure it out. I'll write it for you." This is what Bill wrote: £3 6s 1d.

"Why don't you try to make a good guess as to what those letters and numerals mean?" asked Mr. Johnson.

"Well, I think the funny looking 'L' stands for pounds, since they put it first on the tag, and it's worth the most," Bill began.

Mr. Johnson agreed, "You're right. The symbol for pound is a special form of the letter 'L'. It stands for the Latin word **librum,** which means **one pound weight.**"

"I bet **s** stands for shilling!" exclaimed Barbara.

"Yes, and **d** for pence!" interrupted Marcia.

"Right again," said Mr. Johnson. "Actually **s** and **d** are the first letters of the names for two old Roman coins. The English don't use the coins any more but the letters have remained."

Mr. Johnson then explained that people sometimes leave off the **s** and **d** signs and use just the pound sign (£) and periods. If we did this the price tag Bill saw would look like this: £3.6.1. When you have just shillings and pence, you use a slant line like this / to stand for shilling because the Latin letter **s,** written ſ, looked like an oblique. Therefore, you might see such a price tag as this: 66/7. What would this tag mean? Yes, 66 shillings, 7 pence.

Let's take some time now to practice using these signs and symbols.

1. Write the following amounts using the signs for pounds, shillings, and pence.
   a. 3 pounds
   b. 11 shillings
   c. 2 pounds, 14 shillings
   d. 40 pounds, 3 shillings, 11 pence
   e. 8 shillings, 9 pence

Check your thinking on page 33.

2. Write the following amounts using only the sign for pounds and any periods needed.
   a. 7 pounds, 6 shillings
   b. 90 pounds, 11 shillings, 2 pence
   c. 5 pounds, 18 shillings, 1 penny
3. Write these amounts using the slant line (which stands for shillings).
   a. 19 shillings, 5 pence
   b. 2 shillings, 7 pence
   c. 1 shilling, 2 pence
   d. 10 shillings, 11 pence

CHECKING YOUR THINKING

1. a. £3
   b. 11s
   c. £2 14s
   d. £40 3s 11d
   e. 8s 9d
2. a. £7.6 or £7.6.0
   b. £90.11.2
   c. £5.18.1
3. a. 19/5
   b. 2/7
   c. 1/2
   d. 10/11

FINDING OUT ON YOUR OWN

Are you interested in finding out more about English coins? The English have many interesting coins and notes. Some of these are very old and are not often used. Others are made only for special occasions. You may want to try to find out about the values or history of some of the following:

Guinea	Sixpence
Sovereign	Threepence
Crown	Twopence
Half Crown	Halfpenny
Florin	Farthing

We Shop With English Money

The Johnson children decided to keep two accounts of their money. Bill and Barbara would keep one account form using English money and Marcia would keep the other using United States money.

Each of the twins had 5 pounds and Marcia had 8 pounds for their stay in England. The three children decided to put all of their money together and start the two new accounts. They agreed to try not to spend more than their own share of the total amount of money.

Let's see if you can keep the two accounts. Make out two account forms. The one that Bill and Barbara kept looks like this:

ACCOUNT FORM

Name Barbara and Bill Johnson							Number 1		
DATE	DESCRIPTION	IN			OUT			BALANCE		
		£	s	d	£	s	d	£	s	d

Use dollars and cents for your other account form since this is the way Marcia kept hers. It will look like the account form on page 9. You may want to reread pages 9 through 11 to review how to keep an account.

The children began their new account forms on August 9.

1. How much in English money did the twins enter as Beginning Cash? (Remember, all three children had put their money together.)
2. How much did Marcia enter as Beginning Cash in United States money?

Check your work on page 36.

The children began their shopping on August 10.

3. In the Scotch House, Bill bought a tartan tie. It cost 10/–, which means 10 shillings and no pence. Enter this expense on the twins' account form. Find the new balance. (Remember that there are 20 shillings in each pound. Therefore, when you subtract to find the new balance you must borrow 1 pound and change it to 20 shillings.)

   Did you think:

	17	20		
Old balance	£18.	0.	0	
Tie	–	10.	0	
New balance	£17.	10.	0	(17 pounds and 10 shillings)

4. Enter the cost of the tie on Marcia's account form. (Remember that 1 shilling equals $.14.)

5. In the same store Barbara found a Scottish doll dressed in kilts. She paid £1.9.6 for it. Enter this on the twins' account form.

   What is the amount of the new balance shown on the twins' account after buying the doll? (Remember that there are 12 pence in each shilling.)

6. What amount in United States money will Marcia enter for the doll on her account?

   What is the new balance shown on Marcia's account after buying the doll?

Since the purchase of the doll ended the shopping for the day, the children then balanced their accounts.

7. Balance each of your account forms. You may want to reread pages 13 and 14 to review how to balance an account.

As you work with these accounts, you can check your thinking on pages 36 through 40.

CHECKING YOUR THINKING

1. The twins entered £18.0.0 as Beginning Cash.
   Did you think: £5 + £5 + £8 = £18
   Did you figure that August was the eighth month?

ACCOUNT FORM

Name Bill and Barbara Johnson							Number 1		
DATE	DESCRIPTION	IN			OUT			BALANCE		
		£	s	d	£	s	d	£	s	d
8/9	Beginning Cash	18	0	0				18	0	0

2. Marcia entered $50.40 as Beginning Cash.

   If you had difficulty changing £18 to United States money, remember you multiply $2.80 (the value of one pound) by 18. If you have not yet learned to do this kind of multiplication, you can work the example by multiplying $2.80 by 8 and then multiplying $2.80 by 10 and adding the two products together. (Do you remember an easy way to multiply by 10?) Check your work with that below.

$$\begin{array}{r} {\scriptstyle 6} \\ \$2.80 \\ \times\ 18 \\ \hline 2240 \\ 2800 \\ \hline \$50.40 \end{array} \quad \text{Or:} \quad \begin{array}{r} {\scriptstyle 6} \\ \$2.80 \\ \times\ 8 \\ \hline \$22.40 \end{array} \qquad \begin{array}{r} \$2.80 \\ \times\ 10 \\ \hline 000 \\ 28\,00 \\ \hline \$28.00 \end{array} \quad (\text{or } 10 \times \$2.80 = \$28.00) \qquad \begin{array}{r} {\scriptstyle 1} \\ \$22.40 \\ +28.00 \\ \hline \$50.40 \end{array}$$

   What happens to the decimal point in the multiplicand ($2.80) when you multiply it by 10?

ACCOUNT FORM

Name Marcia Johnson						Number 1	
DATE	DESCRIPTION	IN		OUT		BALANCE	
8/9	Beginning Cash	50	40			50	40

3. ACCOUNT FORM

Name Bill and Barbara Johnson								Number 1		
DATE	DESCRIPTION	IN			OUT			BALANCE		
		£	s	d	£	s	d	£	s	d
8/9	Beginning Cash	18	0	0				18	0	0
8/10	Tie					10	0	17	10	0

The Twins' Work

~~£18.~~	~~0.~~	0
—	10.	0
£17.	10.	0 New Balance

4. ACCOUNT FORM

Name Marcia Johnson						Number 1	
DATE	DESCRIPTION	IN		OUT		BALANCE	
8/9	Beginning Cash	50	40			50	40
8/10	Tie			1	40	49	00

Marcia's Work

$50.40
-1.40
$49.00 New Balance

Did you find that 10 shillings equals $1.40? Did you use the easy way to multiply by 10? $10 \times \$.14 = \$1.40$.

5. ACCOUNT FORM

Name Bill and Barbara Johnson								Number 1		
DATE	DESCRIPTION	IN			OUT			BALANCE		
		£	s	d	£	s	d	£	s	d
8/9	Beginning Cash	18	0	0				18	0	0
8/10	Tie					10	0	17	10	0
8/10	Doll				1	9	6	16	0	6

The Twins' Work

Twins' balance £17.~~10.0~~
Doll —1. 9.6
£16. 0.6 New Balance

6. Marcia entered \$4.13 in the **Out** column for the doll. Did you think:

Step 1. £1 = \$2.80

Step 2. 9/- = 9 × \$.14; $\overset{3}{\$.14}$

$$\times\ 9$$

$$\$1.26$$

Or, 10/- = \$1.40 so 9/- = \$1.40 − \$.14 or \$1.26

Step 3. 6d = \$.07

1 1

Step 4. \$2.80

1.26

.07

\$4.13 cost of doll in United States money

ACCOUNT FORM

Name Marcia Johnson						Number 1	
DATE	DESCRIPTION	IN		OUT		BALANCE	
8/9	Beginning Cash	50	40			50	40
8/10	Tie			1	40	49	00
8/10	Doll			1	13	11	07

Marcia's Work

8 9 10

~~\$49.00~~

−4.13

\$44.87 New Balance

Do you see why the English money system is harder to work with than a decimal system? When you work with a decimal system, you have a single base (10). When you subtract, you can change a ten to 10 ones, a hundred to 10 tens, a thousand to 100 tens, and so on. Study the following subtraction example in the English system.

8	20 + 1	12 + 1
9 pounds	2 shillings	1 penny
−4 pounds	3 shillings	2 pence

In order to complete this subtraction you must first change 1 shilling to pence. How many pence are there in 1 shilling? Yes, 12, so you must add 12 to the penny in the minuend. You

can then subtract the pence. However, in order to subtract in the shillings column you must change a pound to shillings. How many shillings in a pound? Yes, 20, so you must add the 20 to the 1 shilling already there. Complete the subtraction. Is your answer 4 pounds 18 shillings 11 pence?

7. The twins balanced their account using:
Outs + **New Balance** = **Ins**

The Twins' Work

Step 1

£0.10.0 tie) Out
+£1. 9.6 doll) Column
£1.19.6 Total Outs

Step 2

1 1
£ 1.19.6 Total Outs
+16. 0.6 Last Balance
£18. 0.0 Total Ins

(You may have balanced your account one of the other two ways. If you did, **Ins** should equal **Outs** + **New Balance**; or, **Ins** − **Outs** should equal **New Balance.**)

Did you have difficulty with Step 2? When you add and carry with English money you must remember what number to carry to the shillings place and to the pounds place. If the sum in the pence' place is 12 or more, you change it to shillings and carry the shillings to the shillings' place. If the sum in the shillings' place is 20 or more, you change it to pounds and then carry the pounds to the pounds' place.

For further practice in adding English money you may want to do the following examples. When you finish them, check your answers with those on the following page.

a	**b**	**c**
9s 9d	£2.10.8	10s 6d
+8s 7d	+1. 7.6	+12s 5d
d	**e**	**f**
£3.15.2	16s 9d	£4.15.10
+ 17.5	+17s 4d	+2.14. 6

Answers to examples.

a	b	c
1	1	
9s 9d	£2.10.8	10s 6d
+8s 7d	+1. 7.6	+12s 5d
18s 4d	£3.18.2	£1 2s11d

d	e	f
1	1	1 1
£3.15.2	16s 9d	£4.15.10
+ 17.5	+17s 4d	+2.14. 6
£4.12.7	£1 14s 1d	£7.10. 4

If you had difficulty, try the examples again. Remember: 12 pence = 1 shilling; 20 shillings = 1 pound.

Marcia balanced her account by:
Outs + New Balance = Ins

Marcia's Work

Step 1.
$1.40 tie) Out
+4.13 doll) Column
$5.53 Total Outs

Step 2.
1 1
$ 5.53 Total Outs
+44.87 Last Balance
$50.40 Total Ins

Do you see how much easier it is to add in a decimal system? When you add and carry in a decimal system, you always carry tens, hundreds (10 tens), thousands (100 tens), and so on.

Your balances agree if you show a last balance of £16.0.6 on the twins' account form and a last balance of $44.87 on Marcia's account form.

£16.0.6 = $44.87

Step 1.
$2.80
× 16
1680
2800
$44.80

Step 2. 6d = $.07

Step 3.
$44.80
+ .07
$44.87

The Last Shopping Trip

On August 11 the children went shopping for the last time. Marcia bought a skirt that cost 90/–. How much is that? Yes, 90 shillings and 0 pence.

1. Is this more than 4 pounds? How much more? How can you find out? Check your thinking on page 42.
2. a. Enter Marcia's purchase on new account forms since the children balanced their accounts on August 10. Remember to start the new account form with the last balance from August 10. It can be described as **Present Balance.** On the twins' account form enter the cost of the skirt as pounds and shillings rather than as all shillings.
   b. Find the new balances. Did you also remember to enter the date and the number of the account form?

   Check your thinking on pages 42 and 43.
3. a. Marcia also bought a Shetland sweater to match her skirt for £3.0.6. Enter this on both accounts.
   b. Find the new balances.

   Check your thinking on pages 43 and 44.
4. Bill saw a tennis racket he wanted. It cost 89/–. How many pounds is this?
5. a. Enter his purchase on both accounts.
   b. Find the new balances.

   Check your thinking on page 44.
6. a. On Regent Street, Barbara bought a Liberty-print hand-blocked scarf for Mother and one for Grandmother. Each scarf cost £1.15.1. How much did Barbara spend for the two scarves? You may want to review adding English money on page 39.
   b. Enter Barbara's purchase on both account forms.
   c. What are the new balances?

   Check your thinking on page 45.
7. The children balanced their accounts. You do the same and then check your thinking and your account forms on pages 46 and 47.

"Well, Barbara," said Bill, looking at the balance on their account form, "it's a good thing we're going home. We don't have much money left."

"That's right, but it was worth it," answered Barbara.

CHECKING YOUR THINKING

1. 90 shillings is more than 4 pounds. 90 shillings = 4 pounds, 10 shillings (£4.10.0).

   Did you think: There are 20 shillings in 1 pound, so there are 4 × 20 shillings in 4 pounds; 4 × 2 = 8, so 4 × 20 = 80; 90 shillings is 10 more than 80 shillings (4 pounds) because 80 + 10 = 90, or 90 − 80 = 10.

Check your thinking and then compare your account forms with the answers below and on the following pages.

2. a. On the twins' account you enter £4.10.0 in the **Out** column. On Marcia's account you enter $12.60 in the **Out** column.

   Did you think as follows:

   Step 1. £4 = 4 × $2.80;

$$\begin{array}{r} {\scriptstyle 3} \\ \$2.80 \\ \times 4 \\ \hline \$11.20 \end{array}$$

   Step 2. 10/− = 10 × $.14 = $1.40 (You probably did this in your head.)

   Step 3. £4.10.0 = $11.20 + 1.40 = $12.60

   £4.10.0 = $12.60 in U. S. money.

   b. The twins now show a balance of £11.10.6. Marcia now shows a balance of $32.27.

The Twins' Work

Step 1. £16. 0.6 Present Balance
−4.10.0 Skirt
.6

1. 0 pence from 6 pence = 6d. I write the 6 in the pence' place.

15 20
Step 2. £~~16~~. ~~0~~.6
−4.10.0
.10.6

2. I can't take 10 shillings from 0/ so I must take 1 of the pounds and then change it to 20 shillings. 20 − 10 shillings = 10/. I write the 10 in the shillings' place.

15 20
Step 3. £~~16~~. ~~0~~.6
−4.10.0
£11.10.6 New Balance

3. 15 pounds − 4 pounds = 11 pounds. I write the 11 in the pounds' place.

Marcia's Work

$44.87 Present Balance
−12.60 Skirt
$32.27 New Balance

Did you number the account form 2? Did you enter the date as 8/11?

3. a. The twins write £3.0.6 in the **Out** column. Marcia writes $8.47 in the **Out** column.

Did you think:

Step 1. £3 = 3 × $2.80;

$$\begin{array}{r} {\scriptstyle 2} \\ \$2.80 \\ \times\ \ 3 \\ \hline \$8.40 \end{array}$$

Step 2. 6d = 7 cents ($.07)

Step 3.
$$\begin{array}{r} \$8.40 \\ +\ .07 \\ \hline \$8.47 \end{array}$$

b. The twins' new balance is £8.10.0.
Marcia's new balance is $23.80.

The Twins' Work	Marcia's Work
	1 12
£11.10.6	$32.27
−3. 0.6	− 8.47
£ 8.10.0 New Balance	$23.80 New Balance

4. 89/- is 89 shillings; 80 shillings = 4 pounds; 89 shillings = 4 pounds and 9 shillings and no pence (£4.9.0). If you have any difficulty with this refer to the answer to Example 1 on page 42.

5. a. The twins enter £4.9.0 in the **Out** column.
Marcia enters $12.46 in the **Out** column.

Did you think as follows:

Step 1. £4 = 4 × $2.80 = $11.20 (See Example **2 a** on page 42)

Step 2. 9/- = 9 × $.14, or $1.40 − $.14 (since $1.40 = 10 shillings)

3		3 10
$.14		$1.40
× 9	or	−.14
$1.26		$1.26

Step 3.
$11.20
+1.26
$12.46

b. The twins' balance is £4.1.0.
Marcia's balance is $11.34.

The Twins' Work	Marcia's Work
	7 10
£8.10.0	$23.80
−4. 9.0	−12.46
£4. 1.0	$11.34

6. a. **Barbara spent £3.11.0 for the two scarves.**

Did you think as follows:

Step 1.	1 £1.15.6 +1.15.6	1. 6d + 6d = 12d; 12 pence = 1 shilling so I change the 12 pence to 1 shilling and carry it to the shillings' place. I now have zero pence so I write 0 in the pence' place.
Step 2.	1 1 £1.15.6 +1.15.6 .11.0	2. 1s + 15s + 15s = 31s; 31 shillings = 1 pound and 11 shillings so I carry the 1 pound to the pounds' place and I write 11 in the shillings' place.
Step 3.	1 1 £1.15.6 +1.15.6 £3.11.0	3. £1 + £1 + £1 = 3 pounds so I write 3 in the pounds' place, and then write the £.

You can also find the answer by multiplying:
2 × £1.15.6 = £3.11.0

b. The twins entered £3.11.0 in the **Out** column.
Marcia entered $9.94 in the **Out** column.
Did you think: £3 = 3 × $2.80 = $8.40; 11/- = $.14 + $1.40 = $1.54 (11/- is 1 more than 10/-). $8.40 + $1.54 = $9.94.

c. The twins' balance is 10/0 or 10/-.
Marcia's balance is $1.40.
Does $1.40 equal 10/-?

The Twins' Work	Marcia's Work
3 21 £4. X.0 –3.11.0	10 13 $11.34 –9.94
10.0 (or 10/-) New Balance	$ 1.40 New Balance

7. Balancing the Twins' Account: Outs + Last Balance = Ins

a. Total the Outs

Step 1.

£4.10.0
3. 0.6
4. 9.0
3.11.0
.6

1. 0d + 6d + 0d + 0d = 6 pence; I write 6 in the pence' place.

Step 2.

1
£4.10.0
3. 0.6
4. 9.0
3.11.0
.10.6

2. 10s + 9s + 11s = 30 shillings; 30 shillings = 1 pound and 10 shillings. I carry the pound to the pounds' place and write 10 in the shillings' place.

Step 3.

1
£4.10.0
3. 0.6
4. 9.0
3.11.0
£15.10.6

3. £1 + £4 + £3 + £4 + £3 = £15 so I write 15 in the pounds' place.
£15.10.6 is the total of **Outs.**

b. Add Outs to Last Balance

Step 1.

£15.10.6
+ 10.0
.6

1. 6d + 0d = 6d. I write 6 in the pence' place.

Step 2.

1
£15.10.6
+ 10.0
0.6

2. 10s + 10s = 20s = £1; I write 0 in the shillings' place and carry 1 pound to the pounds' place.

Step 3.

£15.10.6
+ 10.0
£16. 0.6

3. £1 + £15 = £16; I write £16 in the pounds' place.
£16. 0.6 = **Ins**

Balancing Marcia's Account: Outs + Last Balance = Ins

a. Total the Outs

22 1
$12.60
8.47
12.46
9.94
$43.47 Total Outs

b. Add Outs to Last Balance

$43.47
+ 1.40
$44.87 Total Ins

Check your account forms with those below to be sure yours are right.

ACCOUNT FORM

Name Bill and Barbara Johnson								Number 2		
DATE	DESCRIPTION	IN			OUT			BALANCE		
		£	s	d	£	s	d	£	s	d
8/11	Present balance	16	0	6				16	0	6
8/11	Skirt				4	10	0	11	10	6
8/11	Sweater				3	0	6	8	10	0
8/11	Tennis racket				4	9	0	4	1	0
8/11	Scarves				3	11	0		10	0
		16	0	6	15	10	6		10	0

ACCOUNT FORM

Name Marcia Johnson						Number 2	
DATE	DESCRIPTION	IN		OUT		BALANCE	
8/11	Present balance	44	87			44	87
8/11	Skirt			12	60	32	27
8/11	Sweater			8	47	23	80
8/11	Tennis racket			12	46	11	34
8/11	Scarves			9	94	1	40
		44	87	43	47	1	40

A Well Planned System of Money

On the plane flying home the Johnsons discussed their trip — the things they enjoyed and the things they learned.

"One thing I learned," said Bill, "is to appreciate our system of money. Imagine having to use the English system all the time!"

"Yes," said Mr. Johnson, "a decimal money system is much easier to use than the English system. That's why most countries of the world have changed to a decimal system of money. I have heard that the English too are considering changing to a decimal system."

"Have we always had a decimal money system?" asked Barbara.

"Yes, almost from the beginning of our country. We were the first country to use a decimal system. In fact, our system is so efficient it has scarcely been changed since it was adopted in 1785."

"We are very fortunate," said Mrs. Johnson. "We copied many of the English ways and customs, such as their system of measurement, but luckily we didn't copy their money system. The founders of our country were very wise when they planned and adopted our United States money system."

This Independent Learning Booklet is part of an experimental project to provide mathematics materials for able pupils and to develop a mathematics program adapted to individual differences. The project is based on several studies and exploratory programs carried on in San Diego County during the past several years, such as those sponsored by the San Diego Metropolitan Education Study Council and the Assistant Superintendents Group. Objectives of this phase of the project are to stimulate and widen pupil interest in various areas of mathematics; to develop deeper insights into mathematical principles, concepts, and relationships; to introduce aspects of modern mathematical thinking; and to develop motivation for able pupils to continue to study and explore mathematics and related fields.

The project is coordinated by the Department of Education, San Diego County, and directed by a steering committee selected from members of the San Diego Metropolitan Education Study Council. Support for the project is derived from funds provided under Title III of the National Defense Education Act of 1958 and matching funds from the participating school districts and the San Diego County Department of Education.

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